Mt. Hays - Masset Digital Radio Goes Into Service

On June 26, Mackenzie Area brought digital service to the Queen Charlotte Islands by linking Masset on Graham Island to Terrace via a new digital radio system. The critical part of this route is the 6 GHz 122 km crossing of the Hecate Strait from Mt. Hays near Prince Rupert to the Masset radio site. Here, BC Tel had to span the longest and perhaps most difficult overwater microwave path in Canada.

The Mt. Hays to Masset path has all three propagation problems - blocking, multipath and sea reflections that make life difficult for microwave system designers. The path is almost three times longer than the average. The path profile doesn't provide enough blocking of echo signals reflected from the sea, especially at high tide. Finally, this path has a long multipath fading season beginning in April and continuing into October. Thirty-six hours periods of continuous severe fading activity is not unusual.

Computer analysis of the path and radio propagation tests were performed in 1989. The results indicated that the standard frequency or space diversity methods to reduce propagation outages wouldn't be enough. A different approach was needed, so BC Tel engineers designed the first quad diversity high capacity digital radio system in Canada. With this method the payload data traffic is applied to two transmitters operating at different frequencies. The transmitters are connected to separate antennas that are vertically spaced on the tower. At the far end, the signal from each transmit antenna is received by two vertically spaced antennas and fed to four receivers. Here, the four signals are electronically adjusted to equalize their path transit times. They are then combined in pairs and demodulated to recover two baseband data streams which are fed to a bit combiner. The bit combiner quickly predicts when an output data stream is likely to become corrupted. It selects the best stream, using a fast error-free switch. The advantage of this technique is that the payload data traffic is sent over four independent radio paths. An error in the final ouput data can occur only if all four paths are simultaineously impaired. By suitable selection of the four antenna heights it's possible to derive a set of paths that can effectively combat blocking, reflections and multipath.

Design calculations predicted that with this technique, it would be possible to meet Telecom Canada long haul performance objectives for voice and data transmission. This was a remarkable result since the existing analog radio can only carry low capacity traffic with frequent impaired transmission during the summer months. The results from the June 1990 fading month show that the predicted performance is being achieved. Monitoring continues and all indications are that the quad diversity setup will handle the worst conditions that this path can deliver.

Although using quad diversity proved to be the key to beating the Hecate Strait, this digital radio crossing could never have been

successful without the co-operative effort of a many BC Tel people. Only some of them are mentioned here. Dave Harvey in the Facility Engineering radio design group and Dave Shimozawa in Transmission Equipment Standards did the computer analysis and path design work. Wally Sharf in the Facility Engineering equipment group looked after the site layouts, ordering, specs and drawings for the entire route back to Terrace. The superb waveguide layout work on this system will be a testimony to Wally Waveguide for many years. Wally is retiring at the end of the year and his talent will be sorely missed. CT&S installers Ron Jones, Dave Ziegler and Al Neil installed the radio equipment to a tight schedule. Prince Rupert radio techs Glen Bondar, John Donahoe and Ron Pollock poured through volumes of manuals to quickly become familiar with the new radio equipment. They completed the lineup and acceptance in record time and solved many large and small problems along the way. They also set up and maintained the path monitoring instruments for the two Daves back in Vancouver. Finally Dave Annan's Mackenzie Area antenna crew worked in difficult weather to get the antenna systems installed and aligned on schedule.

The Mt. Hays to Masset digital radio crossing is an example of the innovative use of technology to solve a difficult engineering problem; but it's more than that. It's also about a group of talented and dedicated individuals - among the very best in the business at what they do, working together to meet a difficult challenge - to provide the people of the Queen Charlottes with modern digital telecommunications services that are as reliable as that available to any other subscriber in Canada. It also says a lot about a Company that was willing to commit this talent and the necessary resources to make this possible. Well done gentlemen! Well done BC Tel!

Dave Shimozawa
Transmission Equipment Stds.